

NH Volunteer River Assessment Program

Water Quality Monitoring Field Sampling Protocols

for Volunteer Monitors



New Hampshire Department of Environmental Services

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www.des.nh.gov/wmb/VRAP/

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Introduction: What is VRAP?

In 1998, the New Hampshire Department of Environmental Services (NHDES) initiated the New Hampshire Volunteer River Assessment Program (VRAP) as a means of expanding public education of water resources in New Hampshire. VRAP promotes awareness and education of the importance of maintaining water quality in rivers and streams. VRAP was created in the wake of the success of the existing New Hampshire Volunteer Lake Assessment Program (VLAP), which provides educational and stewardship opportunities pertaining to lakes and ponds to New Hampshire's residents.



Today, VRAP continues to serve the public by providing water quality monitoring equipment, technical support, and educational programs. In 2005, VRAP supported twenty-eight volunteer groups on numerous rivers and watersheds throughout the state. These volunteer groups conduct water quality monitoring on an ongoing basis. The work of the VRAP volunteers increases the amount of river water quality information available to local, state and federal governments, which allows for effective financial resource allocation and watershed planning.

This manual is meant to be used as a guide for VRAP monitors. Take this manual with you when you collect samples as a reminder of the proper procedures. Each meter has a very important calibration procedure, which must be followed to ensure the sampling results are as accurate as possible. If you encounter problems during calibration, refer to the manufacturer's operation manuals or contact the VRAP Coordinator. Note: If procedures are not followed, the data may not be valid.

This manual is designed to compliment the annual VRAP trainings and is not a replacement for attending a training. VRAP staff are available to visit with each group in the field. Please contact us if you are interested in scheduling a site visit.

Informational Resources

- ❖ **Water Quality Monitoring Field Sampling Protocols for Volunteer Monitors:** <http://www.des.nh.gov/wmb/vrap/pdf/Protocols.pdf>.
- ❖ **VRAP Equipment & Supply Checklist:** <http://www.des.nh.gov/wmb/vrap/pdf/2006VRAPEquipmentAndSupplyKitChecklist.pdf>.
- ❖ **VRAP Field Data Sheet:** <http://www.des.nh.gov/wmb/vrap/pdf/DataSheet.pdf>.
- ❖ **VRAP Water Quality Standards:** http://www.des.nh.gov/wmb/vrap/pdf/WQ_Standards.pdf.
- ❖ **Interpreting VRAP Water Quality Parameters:** <http://www.des.nh.gov/wmb/vrap/pdf/WQParams.pdf>.

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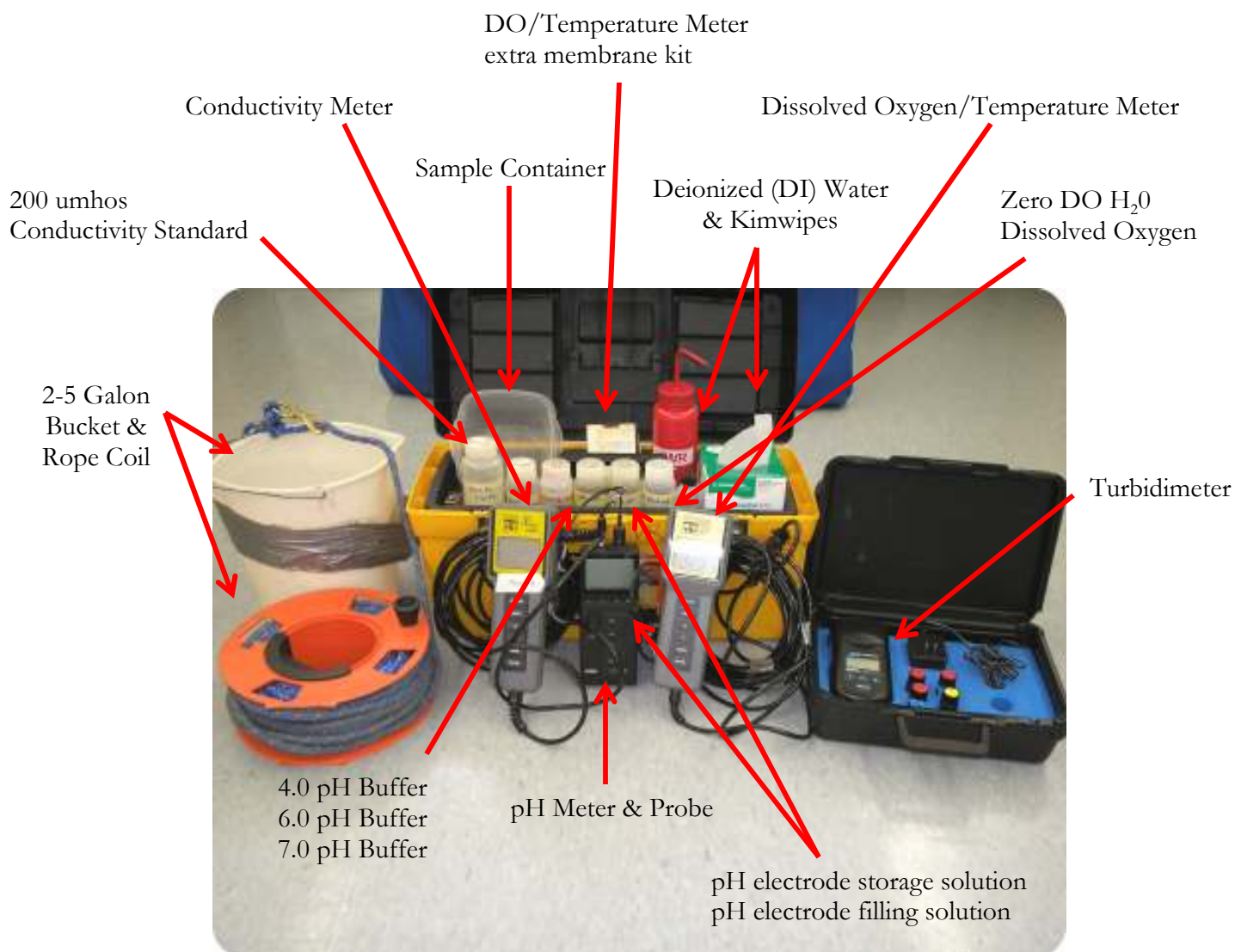
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Equipment & Supplies

Necessary Items

Please ensure that you have all necessary equipment and supplies before each sampling event. An **Equipment & Supply Checklist** can be found in each VRAP kit and is also available electronically at <http://www.des.nh.gov/wmb/vrap/pdf/2006VRAPEquipmentAndSupplyKitChecklist.pdf>.



Example of a field kit

Other Necessary Supplies

- ❖ Cooler & Ice Packs (*If sampling for bacteria*)
- ❖ Clipboard & Pencils (*pencils will write in wet weather*)
- ❖ Batteries (AA and 9V)
- ❖ Masking Tape & Plastic Sample/Laboratory Bottles (*If testing for additional parameters such as TP, TKN, Bacteria, etc*)

Optional Supplies

- ❖ Bug spray
- ❖ Camera
- ❖ Drinking Water & Snack
- ❖ Trash bags
- ❖ Waders/Boots/Shoes that can get wet
- ❖ Warm dry clothes

Quality Assurance & Quality Control

In order for VRAP data to be used in the assessment of New Hampshire's surface waters, the data must meet quality control guidelines as outlined in the VRAP Quality Assurance Project Plan (QAPP). The VRAP QAPP was approved by NHDES and reviewed by EPA in the summer of 2003. The QAPP is reviewed annually and is officially updated and approved every five years. The VRAP Quality Assurance/Quality Control (QA/QC) measures include a six-step approach to ensuring the accuracy of the equipment and consistency in sampling efforts.

1. **Calibration:** Prior to each measurement, the pH and DO meters must be calibrated. The turbidity and conductivity meters only need to be checked before the first and after the last measurement.
2. **Replicate Analysis:** A second measurement by each meter is taken from the same sample at one of the stations during the sampling day (not at the same station as the previous sampling date). Be sure to recalibrate the pH and DO meter before doing the second measurement. Replicates should be measured within 15 minutes of the original measurements. If more than one team is out sampling each team should do a replicate analysis. Record the measurement on the bottom of the front page of the VRAP Field Data Sheet.
3. **Zero Oxygen Solution:** A reading of the zero oxygen solution is recorded at one of the stations during the sampling day (not at the same station as the previous sampling date.) Record the reading, station, and time on the bottom of the front page of the VRAP Field Data Sheet. The value should be below 1.0 mg/L.
4. **6.0 pH Standard:** A reading of the pH 6.0 buffer is recorded at one of the stations during the sampling day (not at the same station as the previous sampling date). Record the reading, station, and time on the bottom of the front page of VRAP Field Data Sheet. Another calibration does not need to be done before this measurement as it is intended to detect drift in the meter
5. **DI Turbidity Blank:** A reading of the DI blank is recorded at one of the stations during the sampling day (not at the same station as the previous sampling date). Record the reading, station, and time on the bottom of front page of VRAP Field Data Sheet.
6. **End of the Day Conductivity and Turbidity Meter Check:** At the conclusion of each sampling day, re-check the conductivity meter with the 200 μ S conductivity standard solution and the turbidity meter with the 1.0 NTU standard. Record the readings on the back of the VRAP Field Data Sheet.

Sample Collection for Field & Laboratory Analysis

Order of Field Tests

- ❖ Turbidity
- ❖ pH
- ❖ Dissolved Oxygen
- ❖ Water Temperature
- ❖ Air Temperature
- ❖ Specific Conductance

Note: Pour off water for laboratory test(s) before sampling field water quality.

Please label all bottles *prior to filling them* with the date and time of collection, NHDES Station Name/ID, collector's initials and the test(s) requested. Note: It is important to use assigned NHDES Station IDs.

NHDES LABORATORY ANALYSIS

If you are collecting *E. coli* samples for laboratory analysis the bottles may be filled using either of the following two methods:

1. Wade out into the river and collect water in a sterilized *E. coli* bottle and transfer the water to shore in a labeled and prepared bottle. Move the bottle from downstream to upstream as you fill the bottle. Dip the bottle into the river in a “U”-shaped scooping motion, turning the bottle right side-up at the bottom of the “U”. Be careful not to put your fingers or any other material on any surface on the inside of the bottle.
2. Fill the bottle using the water in the bucket. This should be done immediately after the bucket sample is collected. Again, be careful not to put your fingers or any other material on any surface on the inside of the bottle.
3. Replace the cap on the bottle and carry the sample to shore.

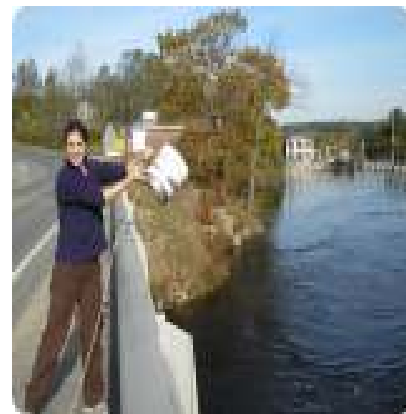
This wading in the river sampling technique should not be used for bottles which have preservatives in them such as **total phosphorous and metals**. The preservatives are very strong acids which will burn the skin on contact. These bottles should only be filled by pouring from the bucket.

4. Preserve the bottle properly (in a cooler on ice), and submit the samples to the NHDES Laboratory Services within the sample holding time appropriate to each test. For more information, call the NHDES Laboratory Services at 271-3445.

When sampling, begin with the most downstream sampling station so that sampling activities do not affect water quality at downstream stations.

BRIDGE SAMPLING:

1. Lower the bucket from the **upstream** side of the bridge into the river and fill the bucket $\frac{1}{4}$ full of water. Pull the bucket up, swish the water around in the bucket to rinse, and dump the water off the downstream/opposite side of the bridge. Repeat this process two more times.



2. Return the bucket to the river on the **upstream** side of the bridge and fill the bucket $\frac{1}{2}$ - $\frac{3}{4}$ full of water as slowly as possible (you may wish to weight one side of the bucket).
3. Pull the bucket up and carry to a safe location (away from the road!) for analyses. Be sure not to bump the bridge.

OFFSHORE SAMPLING:

1. Carefully wade out into the river as close as possible to the center. Do not enter the water above your waist, and do not enter the water if there is any concern for your safety. Be sure to have someone on shore that knows where you are. DES highly recommends that volunteers wear an appropriate personal floatation device when working in or near the water.
2. Position yourself facing **upstream** and rinse the bucket in the river three times. **Do not collect the water that is running over your legs/boots.**
3. With the bucket facing **upstream** and held in front of your body, slowly dip the lip of the bucket into the flowing water and allow the bucket to fill. Rivers receive oxygen from the atmosphere through mixing. Just as riffles and rapids increase the oxygen in a river or stream, rushing water over the side of the bucket will add oxygen to the sample and yield inaccurate readings.
4. Carefully return to shore with the bucket $\frac{1}{2}$ - $\frac{3}{4}$ full and place it on the bank for immediate analysis.



Dissolved Oxygen & Temperature

❖ YSI Model 30 Conductivity Meter **OR**

YSI Model 85 Dissolved Oxygen/Conductivity/Salinity/Temperature Meter

CALIBRATION:

Calibration of the DO/Temp meter is required prior to each individual measurement. **Ensure the meter has been turned ON for at least 15 minutes before calibrating.**

1. Turn meter on by pressing the **ON/OFF** button. Press the **MODE** button until dissolved oxygen is displayed in the mg/L or % air saturation. Once the meter is displaying either mg/L or % saturation the **MODE** button can be used to switch back and forth between them.

YSI 95



OR

YSI 85



YSI 95 measurement probe with black protective cage and membrane.



YSI 85 measurement probe with black protective cage and membrane.

2. To ensure the probe remains moist inside the meter calibration/storage chamber, pull the probe out of the chamber and add 6-7 drops of deionized (DI) water to the sponge at the bottom of the calibration/storage chamber. Turn the meter on its side to allow any excess water to drain out of the chamber. *This step will only be necessary once per day, but be sure the sponge in the calibration/storage chamber is moist before storage.* Be careful not to over-wet the sponge. *Calibrate the meter after excess “puddled” water is drained from the chamber.*

Note: The wet sponge creates a 100% saturated air environment within the chamber for ideal calibration conditions. Ensure that the sensor does not contact the wet sponge by inserting the probe only until the rubber seal is flush with the outer edge of the chamber.

3. Unscrew the black protective cage from the end of the probe and without any contact with the membrane surface. Examine the probe tip (a gold disk surrounded by a black circle) for any obvious air bubbles trapped beneath the membrane surface.

If Air Bubbles ARE Detected:

If bubbles are detected or if membrane is due for routine replacement, follow Step a through Step g below to replace the membrane. (On the field data sheet, record the performed maintenance.) Otherwise proceed with Step 4 below.

- a. Unscrew and remove the black protective cage.
- b. Unscrew and remove the old membrane cap.
- c. Thoroughly rinse the sensor tip (gold and silver areas) with DI water.
- d. Hold the membrane cap upside down and add 6 to 7 drops of the probe solution (about half full) that is included in the replacement membrane kit.
- e. Tap the bottom of the cap with your finger a few times to remove any trapped air bubbles.
CAUTION: Do not touch the membrane surface.
- f. Screw the membrane cap onto the probe tightly by hand (to prevent leakage of probe solution). A small amount of probe solution should overflow.
- g. Shake off any excess probe solution and rinse the sensor thoroughly with distilled water to prevent corrosion.

If Air Bubbles ARE NOT Detected:

4. Replace the black protective cage, **rinse the probe** with DI water, and return it to the calibration chamber.
5. **Ensure the meter has been on for 15 minutes before calibrating.** Record the time the dissolved oxygen meter was turned on - on the upper right front page of the VRAP Field Data Sheet. If 15 minutes have not yet elapsed, you may move on to calibration procedures for the other equipment.
6. Record the time of the first dissolved oxygen calibration on the upper right front page of the VRAP Field Data Sheet.
7. Press and release both the **DOWN** and **UP** arrow buttons (**DOWN** slightly prior to **UP**) to enter the DO/Temp meter calibration menu. You will see **CAL** in the lower left hand corner when you have successfully entered calibration mode.
8. The screen will prompt you to enter the local altitude in hundreds of feet. Use the **UP** and **DOWN** arrows to adjust the reading appropriately (For example, entering a 12 indicates 1200 feet above sea level) and press **ENTER**.
9. If using the YSI 95, the screen will prompt you to enter the salinity of the sample you will be measuring. Be sure the screen reads zero and press **ENTER**.

10. **Record** the calibration value (displayed on the bottom right-corner of the LCD screen) on the VRAP Field Data Sheet. The calibration value will vary with altitude and thus may be different at each station if the altitude varies. Watch to ensure that this number does not drift (i.e. goes from 98.9% to 96.7% within a few minutes). If drift occurs first check the sponge in the chamber to ensure that it is saturated. Also check the condition of the membrane again and replace if air bubbles are present or the membrane is damaged.
11. Press **ENTER** again and the display should read “SAVE” and then return to normal measurement mode. Press **ENTER** one last time.
12. **Leave the meter on until you are finished with all measurements for the day. Calibration must be repeated before each individual measurement. If the meter shuts off, you must wait 15 minutes before calibrating.**
13. In rare cases you may measure the DO concentration of saline (salt) waters. If so, use the conductivity meter to determine the salinity before completing the DO/Temp Meter Calibration procedure. (Use arrow keys to adjust the reading to the appropriate salinity and press **ENTER**).

DISSOLVED OXYGEN PROBE PRECAUTIONS

- ❖ Membrane life depends on usage. Membranes will last a long time if installed properly and treated with care. Erratic readings are a result of loose, wrinkled, damaged, or fouled membranes, or from large bubbles in the electrolyte reservoir. If erratic readings or evidence of membrane damage occurs, you should replace the membrane and the solution.
- ❖ To keep the electrolyte from drying out, store the probe in the calibration chamber with the damp sponge.

SAMPLING:

Note: The DO meter must be calibrated prior to each DO measurement.

Dissolved Oxygen (mg/L and % Saturation)

1. Remove the DO/Temp probe from the calibration chamber, **rinse** the probe and cable (approximately 6 inches) with DI water. If necessary, press the **MODE** button until dissolved oxygen is displayed in the mg/L or % air saturation.
2. Submerge the DO/Temp probe about 2/3 of the way into the large bucket and agitate by slowly moving the probe back and forth in the sample for a minimum of two minutes for the temperature and dissolved oxygen readings to stabilize. Some bouncing will occur due to the probes' sensitivity. **Record** the temperature (°C) and the DO (**mg/L and % saturation**) on the VRAP Field Data Sheet. (Press the **UP** button on the YSI 95 or the **MODE** button on the YSI 85 to shift from mg/L to %saturation.)
3. To determine the air temperature (°C), carefully prop the DO/Temp probe up on top of a clean surface and allow the temperature reading to stabilize. The goal is to determine ambient air temperature so the probe should not be placed in either deep shade or on a reflective surface. **It will only take a minute for the air temperature reading to stabilize. Do not leave the probe out of the chamber longer as it will damage the membrane.**
4. Rinse the probe with DI water and return it to the storage chamber.



Measurement probe in sample bucket.

- Wait two minutes and **record** the dissolved oxygen % saturation on the VRAP Field Data Sheet in the column marked “Dissolved Oxygen / % saturation in chamber”. Press the **MODE** button to shift back to % saturation.
- The DO/Temp meter should remain on until the last station has been sampled and the meter has been calibrated following the last test. **If the meter is turned off prior to the end of the sampling day, the meter must be turned on and allowed a 15-minute warm-up period prior to calibration and additional sampling.**
- Rinse the probe with DI water before returning it to the calibration chamber.

pH

❖ Orion 210A pH Meter

CALIBRATION:

The calibration procedure is required prior to each individual pH measurement.

- Ensure electrode connections are properly fastened in the appropriate ports.
- Unscrew the cap on the Electrode Storage Container and remove the end of the pH probe (the screw cap can remain on the electrode). Clean any salty deposits off by rinsing the probe with DI water. Blot dry with a Kimwipe. **CAUTION:** Be sure to never touch the glass bulb; even with a Kimwipe.
- If necessary, remove the blue plug from the hole in the side of the probe and refill the electrode with pH electrode filling solution (it may have spilled out). Fill to just below the hole, at least one inch above sample level. Return the blue plug to the hole in the side of the probe for storage and travel between sites. Remove the plug during calibration and sampling.
- Shake air bubbles from the measurement end (opposite the wires), by gently tapping the outside of the probe against your finger.
- Press the **POWER** key to turn the meter on. All the features of the display will light up. Then the model number, “210”, will be displayed. Once all power up procedures are complete the meter advances to “**MEASURE**” mode.
- Select calibration mode by pressing the **MODE** key until “**CALIBRATE**” is displayed.

First Standard to Test (7.0 pH Buffer):

- The last calibration standards, or “buffers”, used will be displayed (7 and 4). Press **YES** to accept this setting. “P1” will be displayed in the lower display field and the standard measurement will be displayed in the main display field. A black arrow will be displayed on the bottom of the screen pointing to 7 indicating that the meter is ready to measure the 7.0 buffer.
- Rinse the electrode** with DI water and blot dry with a Kimwipe.



9. If necessary, remove the blue plug from the side of the electrode and immerse the probe into the 7.0 buffer (yellow solution). Allow at least one inch of the pH electrode filling solution volume inside the probe to remain above the sample and standard level during measurement/calibration. The end of the probe must be completely immersed into the sample.
10. When **“READY”** is displayed (Watch for it- it comes and goes quickly!) the electrode is stabilized. Press **YES** while **“READY”** is displayed.

Second Standard to Test (4.0 pH Buffer):

Note: **“P2”** will be displayed in the lower display field - indicating the meter is ready for the second standard. Make sure **“P2”** appears before continuing. If it does not appear, keep the electrode in the 7.0 buffer until **“READY”** appears again and press **YES**. A black arrow will be displayed on the bottom of the screen pointing to 4 indicating that the meter is ready to measure the 4.0 buffer.

10. Remove the electrode from the 7.0 buffer, **rinse** it with DI water and blot dry with a Kimwipe.
11. Place the electrode in the second (4.0) buffer. When **“READY”** is displayed press **YES. WATCH!**
12. **“SLP”** (Slope Value) will appear in the lower display field and the current electrode slope will be displayed in the main field. **Record** the number on your VRAP Field Data Sheet. An acceptable range for the slope is 92-102%. If you get a slope outside of this range repeat the calibration procedure and check the batteries. If the slope is still outside of the range do not use the meter for that day and notify the VRAP coordinator immediately. If you miss the slope you must go back and repeat the calibration procedure. pH data without calibration slopes will not pass our quality control process.
13. The meter will proceed to the measure mode; **“MEASURE”** is displayed above the main display field. Remove the electrode from the 4.0 buffer, **rinse** with DI water and blot dry. The meter is now ready for use.
14. Place the electrode **VERTICALLY** in the storage solution container, being careful not to hit the bottom of the container with the probe and screw the cap on the container. Secure the blue plug in the electrode and set the meter in the kit until you are ready to take a reading (**Remember, you will have to press the POWER key twice to restore power if a half hour or more has elapsed between calibration and sampling**).

Rinse the storage solution from the probe before any pH measurements and remember to calibrate between samples.

SAMPLING:

Note: pH meter must be calibrated prior to each pH measurement

1. Remove the probe, **rinse** with DI water and blot the plastic areas dry with a Kimwipe. **CAUTION:** Be sure to never touch the glass bulb/measurement end; even with a Kimwipe.
2. If necessary, remove the blue plug from the probe and ensure it is clean.
3. Immerse the pH probe into the plastic sample container and remove the blue plug from the side of the electrode. (Press the **POWER** key twice if the display screen has gone blank, this will occur if a half hour or more has elapsed since the last key was pressed.) The meter should be in the **“MEASURE”** mode. **Important: Do not let the electrode sit on the bottom of the sample container. Submerge the bottom two inches of the electrode and agitate by slowly moving the electrode back and forth in the sample for a minimum of two minutes for the pH reading to stabilize.** Be careful not to submerge/let water into the probe.

3. With the “**READY**” indicator displayed (**WATCH!**), **record** the value on the VRAP Field Data Sheet.



4. **Rinse** the probe with DI water and return it to the storage chamber containing pH electrode storage solution. Make sure the pH electrode storage container is filled about half way with *pH Electrode Storage Solution* and ensure that the electrode is immersed in the storage solution. Be careful not to push the electrode against the bottom of the container as this could damage the electrode. **CAUTION:** Never store pH probe in DI water!
5. Return the meter and the probe to the VRAP Kit. Set the probe upright, and be sure the blue cap is secured in the probe, even with a little masking tape. This will help preserve the equipment.

❖ Oakton pH 11 Meter

CALIBRATION:

The calibration procedure is required prior to each individual pH measurement.

1. Ensure electrode connections are properly fastened in the appropriate ports.
2. Unscrew the cap on the Electrode Storage Container and remove the end of the pH probe (the screw cap can remain on the electrode). Clean any salty deposits off by rinsing the probe with DI water. Blot dry with a Kimwipe. **CAUTION:** Be sure to never touch the glass bulb; even with a Kimwipe.
3. Press the **ON/OFF** key to turn the meter on.
3. If necessary, press the **MODE** key to select pH mode **MEASURE**. The pH indicator appears in the upper right hand corner of the display.
4. Shake air bubbles from the measurement end (opposite the wires), by gently tapping the outside of the probe against your finger.



First Standard to Test (7.0 pH Buffer):

3. Immerse the probe into the 7.0 buffer (yellow solution). The end of the probe must be completely immersed into the sample.
4. Press the **CAL/MEAS** key to enter pH calibration mode. The **CAL** indicator will be shown. The primary display will show the measured reading while the smaller secondary display will indicate the pH standard buffer solution.
5. Wait for the measured pH value to stabilize (The **READY** indicator will be shown only if it is activated in the set up menu).
1. Press **HOLD/ENTER** key to confirm calibration. The meter is now calibrated to the current buffer.

Second Standard to Test (4.0 pH Buffer):

7. Remove the electrode from the 7.0 buffer, **rinse** it with DI water and blot dry with a Kimwipe.
8. Place the electrode in the second (4.0) buffer.
9. Wait for the measured pH value to stabilize (The **READY** indicator will be shown only if it is activated in the set up menu).
10. Press **HOLD/ENTER** button to confirm calibration. The meter is now calibrated to the current buffer.

View pH Electrode Slope:

11. Enter measurement mode by pressing the **MEAS/CAL** button.
12. Press the **SETUP** button to enter Set Up mode.
14. Press the **MI/UP** or **MR/DOWN** buttons to scroll through subgroups until you view parameter P3.0.
15. Press the **HOLD/ENTER** button.
16. The display shows the electrode offset value. It is the mV offset at pH 7.00. If you have not calibrated at any buffer, the primary display shows “---”.
17. Press the **HOLD/ENTER** key to proceed to electrode slope display. **Record** the number on your VRAP Field Data Sheet
18. The display shows electrode slope in percentage. Slope displayed will be the current slope of the slope zone to which a measurement is made or calibration is done.
19. At any point, you can press the **CAL/MEAS** button to return to measurement mode.
18. The meter will proceed to the measure mode; “**MEASURE**” is displayed above the main display field. Remove the electrode from the 4.0 buffer, **rinse** with DI water and blot dry. The meter is now ready for use.
19. Place the electrode **VERTICALLY** in the storage solution container, being careful not to hit the bottom of the container with the probe and screw the cap on the container.

Rinse the storage solution from the probe before any pH measurements and remember to calibrate between samples.

SAMPLING:

Note: pH meter must be calibrated prior to each pH measurement

1. Remove the probe, **rinse** with DI water and blot the plastic areas dry with a Kimwipe. **CAUTION:** Be sure to never touch the glass bulb/measurement end; even with a Kimwipe.
2. Press **ON/OFF** to turn on meter. **MEASURE** mode will appear on the top center of the LCD.
3. Immerse the pH probe into the plastic sample container. The meter should be in the “**MEASURE**” mode. **Important: Do not let the electrode sit on the bottom of the sample container. Submerge the bottom two inches of the electrode and agitate by slowly moving the electrode back and forth in the sample for a minimum of two minutes for the pH reading to stabilize.**
4. With the “**READY**” indicator displayed (**WATCH!**), **record** the value on the VRAP Field Data Sheet.
5. **Rinse** the probe with DI water and return it to the storage chamber containing pH electrode storage solution. Make sure the pH electrode storage container is filled about half way with *pH Electrode Storage Solution* and ensure that the electrode is immersed in the storage solution. Be careful not to push the electrode against the bottom of the container as this could damage the electrode. **CAUTION:** Never store pH probe in DI water!
6. Return the meter and the probe to its kit.

Turbidity

❖ LaMotte 2020 Turbidimeter

CALIBRATION:

1. From the turbidimeter case (black, separate from the VRAP Kit) remove the standard vial marked “**1.0 NTU**” (if readings at this site tend to be greater than 8, use the “10 NTU” vial and note on data sheet) and carefully **wipe** off any water, dust and/or fingerprints with a Kimwipe only.
2. Open the lid of the turbidimeter and align the etched arrow on the “1.0 NTU” vial. With the arrow under the meter lid, insert the vial into the chamber and close the lid.
3. Press the **READ** button. A triangle should be displayed in the upper left corner of the display screen.



Note: If the triangle is not displayed, turn the meter off by holding the **READ** button down until the screen reads **OFF**. Press the **CAL** button while pressing the **READ** button to turn the meter on. If the triangle does not appear, gently repeat this step until it does. This step places the meter into “EPA mode”, which means the meter will automatically round readings to Environmental Protection Agency standards for uniform data reporting.

4. If the displayed value is the same as the 1.0 (or 10.0) NTU Standard, calibration is not necessary at this time. **Record** 1.0 (or 10.0) on the top left of the VRAP Field Data Sheet as the Initial Turbidity Calibration Value.

5. If the displayed value differs from the standard value (1.0 NTU), record the value on the top left of the VRAP Field Data Sheet as the initial Turbidity Calibration Value, and push the **CAL** button until “**CAL**” is displayed. Release the button. The display will flash.
6. Adjust the reading with the up and down buttons, indicated with arrows, until the value of the standard is displayed.
7. Push the **CAL** button again to complete calibration.
8. Hold the **READ** button down until **OFF** is displayed on the screen to turn the meter off.

SAMPLING:

Note: The turbidimeter needs to be calibrated twice per sampling date (one prior to the first measurement and once after the last measurement. Please turn the meter off when not in use to conserve battery power.

1. Rinse the plastic sample container with DI water. Then rinse the same container twice with a small amount of river water from the bucket.
 2. Pour sample water from the bucket into the plastic sample container (1/2 full) slowly to avoid adding bubbles to the sample.
 3. From the turbidimeter case remove the vial labeled “Sample” or “S” and **rinse** it out with DI water.
 4. Rinse the vial twice with DI water and once with river water from the plastic sample container.
 5. Fill the vial with river water by carefully and slowly pouring the water down the side of the sample vial to avoid introducing any bubbles.
 6. **Wipe** any water, dust and/or fingerprints with a Kimwipe.
- Note: Any residue on the vials will interfere with an accurate turbidity reading. Anything other than Kimwipes may scratch the vials, causing inaccurate readings.**



7. Open the lid of the Turbidimeter and align the etched arrow on the cleaned (“Sample”) vial with the arrow under the Turbidimeter lid, and 8) Close the lid.



9. Push the **READ** button. A triangle should be displayed in the upper left corner of the display screen.

If the triangle is not displayed, turn the meter off by holding the **READ** button down until the screen reads **OFF**. Press the **CAL** button while pressing the **READ** button to turn the meter on. If the triangle does not appear, gently repeat this step until it does. This step places the meter into “EPA mode”, which means the meter will automatically round readings to Environmental Protection Agency standards for uniform data reporting.



10. **Record** the displayed turbidity reading on the VRAP Field Data Sheet.

11. Turn the meter off by holding the **READ** button down until the screen reads **“OFF”**. Remove the sample vial, empty it and rinse with DI water. Fill the sample vial with DI water.

12. At the end of the day, recheck the meter and **record** the 1.0 standard value in the “End of Day Meter Check” section on the back of the VRAP Field Data Sheet.

❖ LaMotte 2020e&i Turbidimeter

CALIBRATION:

1. Turn the meter **ON**.

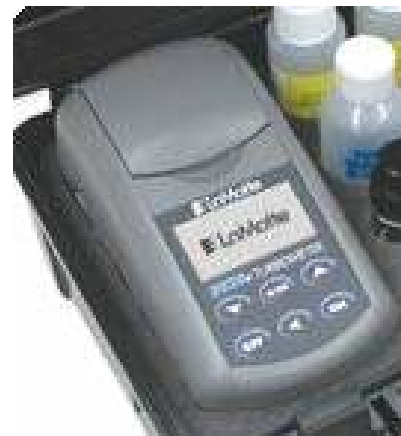
2. Select **MEASURE** mode. This will automatically place you in **TURBIDITY** mode.

3. Open the lid of the turbidimeter and align the single, squared-off notch on the “0 NTU” (Blank) vial with the vertical, white indexing line that is printed on the tube. Carefully **wipe** off any water, dust and/or fingerprints with a Kimwipe only.

4. Insert the vial into the chamber. Close lid. **SCAN BLANK**.

5. After scanning the blank, scan the blank as a sample. It should read 0.00. If not, re-blank the meter and scan the blank again until it reads 0.00. A small negative number will be observed if the reading is slightly less than the reading used as the blank. This is expected due to minute variations between readings. Remove the vial.

6. Open the lid of the turbidimeter and align the single, squared-off notch on the **“1.0 NTU Standard”** vial with the vertical, white indexing line that is printed on the tube. Carefully **wipe** off any water, dust and/or fingerprints with a Kimwipe only.



2. Insert the vial into the chamber. Close lid. **SCAN SAMPLE**.
3. **Record** 1.0 (or 10.0) on the top left of the VRAP Field Data Sheet as the Initial Turbidity Calibration Value.
4. Press **DOWN ARROW** until calibrate appears on the LCD screen, and then press ***OK** to select **CALIBRATE**.
5. Use **DOWN ARROW** and/or **UP ARROW** to change highlighted digits on the display to read **01.00**. *OK moves the highlight to the next digit.
6. Select **SET**.
7. Select ***OK** to proceed to measurement mode.
8. Turn the meter **OFF**.

SAMPLING:

Note: The turbidimeter needs to be calibrated twice per sampling date (one prior to the first measurement and once after the last measurement. Please turn the meter off when not in use to conserve battery power.

1. Rinse the plastic sample container with DI water. Then rinse the same container twice with a small amount of river water from the bucket.
2. Pour sample water from the bucket into the plastic sample container (2/3 full) slowly to avoid adding bubbles to the sample.
3. From the Turbidimeter case remove the vial labeled “Sample” or “S” and **rinse** it out with DI water.
4. Rinse the vial twice with DI water and once with river water from the plastic sample container.
5. Fill the vial with river water by carefully and slowly pouring the water down the side of the sample vial to avoid introducing any bubbles.
6. **Wipe** any water, dust and/or fingerprints with a Kimwipe. **Note:** Any residue on the vials will interfere with an accurate turbidity reading. Anything other than Kimwipes may scratch the vials, causing inaccurate readings.
7. Open the lid of the turbidimeter and align the single, squared-off notch on the cleaned (“Sample”) vial with the vertical, white indexing line that is printed on the tube. Carefully **wipe** off any water, dust and/or fingerprints with a Kimwipe only. Close the lid.
8. Make sure you scroll down so the meter reads “Scan Sample” (otherwise the meter will read “Scan Blank”).
9. **SCAN SAMPLE**.
10. **Record** the displayed turbidity reading on the VRAP Field Data Sheet.
11. Turn the meter **OFF**. Remove the sample vial, empty it and rinse with DI water. Fill the sample vial with DI water.
12. At the end of the day, recheck the meter and **record** the 1.0 standard value in the “End of Day Meter Check” section on the back of the VRAP Field Data Sheet.

Specific Conductance

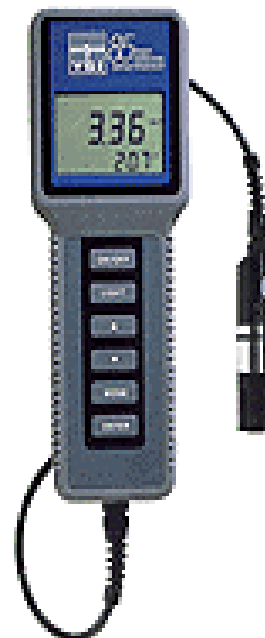
❖ YSI Model 30 Conductivity Meter **OR**

YSI Model 85 Dissolved Oxygen/Conductivity/Salinity/Temperature Meter

YSI 30



YSI 85



OR

METER CHECK:

1. If using the YSI 95, turn the meter on by pressing the **ON/OFF** key. The meter will activate all segments of the display screen for a few seconds, followed by a self-test. If the meter is not functioning properly, a continuous error message will be displayed. **Note: If using the YSI 85, it should already be turned on.**
2. If the **“°C”** is not flashing on and off, press the **MODE** key until it does. This puts the meter into the temperature compensated mode.
3. **Rinse** the probe with DI water and blot dry with a Kimwipe.
4. Submerge the probe in the **200 μ S** conductivity standard solution, and allow to stabilize for two minutes. Ensure there is enough solution to cover the top opening of the probe.
5. **Record** the Initial Specific Conductance Calibration Value on the top left of the VRAP Field Data Sheet. Ensure there are no air bubbles on or inside the probe. A 10% error (or reading of 175-225 μ S) is acceptable. If the readings are outside of this range you can still take measurements but please contact the VRAP Coordinator as soon as possible.
6. **Rinse** the probe with DI water and return it to the storage chamber.

SAMPLING:

1. Press the **ON/OFF** key to turn the meter on. If the “°C” is not flashing on and off, press the **MODE** key until it does (this puts the meter into the temperature compensated mode). If using a different meter, ensure that it is in specific conductivity mode.
2. **Rinse** the probe with DI water and blot dry with a Kimwipe. Shake probe to remove water from the oval upper conductivity opening.
3. Immerse the probe in the sample and make sure it is deep enough to cover the entire probe. Do not allow the probe to touch any solid object or the bottom of the bucket while you are taking readings. It is also important that there are no air bubbles on/in the electrode. To dislodge any bubbles, gently move the electrode through the water before recording the measurement.
4. Agitate by slowly moving the probe back and forth in the sample for a minimum of two minutes for the temperature and specific conductance readings to stabilize. **Record** the conductivity reading on the VRAP Field Data Sheet.
5. **Rinse** the probe and return it to the storage chamber between measurements. If using the YSI 95, please turn off when not in use to conserve battery power. If using the YSI 85, please keep on for the remainder of the sampling day.
6. At the end of the day, recheck the meter with the 200 *umhos* standard and **record** the value in the “End of Day Meter Check” section on the back of the VRAP Field Data Sheet.



YSI 30 measurement probe in sample bucket

End of Day Meter Check & Checklist

❖ Dissolved Oxygen Meter

1. Rinse the DO probe with DI water.
2. Return the probe to the chamber with wet sponge. Drain any “puddled” water from the chamber.
3. Turn off the meter.

❖ pH Meter

1. Turn off the meter.
2. Rinse the probe with DI water and blot dry with a Kimwipe.
3. If necessary, insert the blue plug into the probe.
4. Return the probe to the storage solution container. Store probe upright.

❖ Turbidity Meter (Check at end of day)

1. Place the 1.0 NTU standard into the meter and record the displayed value under “End of Day Meter Check” on the back of the VRAP Field Data Sheet.
2. Rinse the sample vial with DI water for storage.
3. Turn off the meter.

❖ Conductivity Meter (Check at end of day)

1. Rinse the probe with DI water.
2. Place probe in the 200 μ S standard. Record the displayed value under “End of Day Meter Check” on the back of the VRAP Field Data Sheet.
3. Rinse the probe with DI water and return to chamber.
4. Turn off the meter.

❖ VRAP Kit

1. Remove used Kimwipes from the kit.
2. Clean off any dirt and moisture.
3. Record any problems you have encountered on the back of the VRAP Field Data Sheet (under “Comments”) and contact the VRAP Coordinator.

Remember:

- ❖ Calibrate the pH and DO meters before each measurement!
- ❖ Do not turn off the DO meter until the end of the day!
- ❖ Run a replicate sample once a day!
- ❖ Test the pH 6.0 Buffer, Turbidity DI Blank, and Zero Oxygen once a day!
- ❖ Check the Conductivity Meter with the 200 Standard at the beginning & end of the day!
- ❖ Check the Turbidity Meter with the 1.0 NTU Standard at the beginning & end of the day!
- ❖ Rinse everything with DI water - a lot!